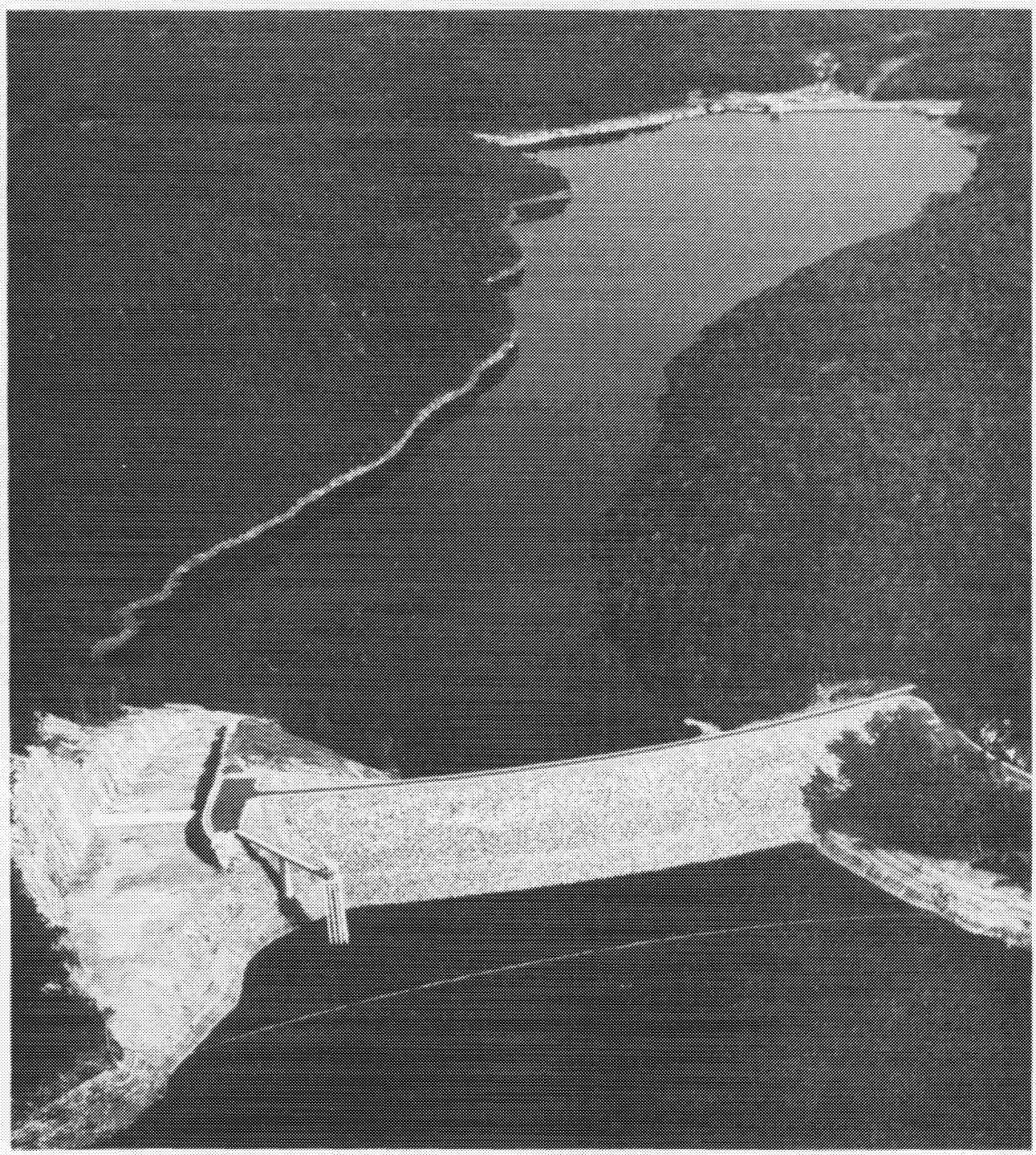
US Army Corps
of Engineers
New England Division

Drought Contingency Plan

SEPTEMBER 1986

Colebrook River Lake, Colebrook, Connecticut



CONNECTICUT RIVER BASIN
FARMINGTON RIVER WATERSHED

DROUGHT CONTINGENCY PLAN
COLEBROOK RIVER LAKE, Colebrook...)

SEPTEMBER 1986

NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

COLEBROOK RIVER LAKE
DROUGHT CONTINGENCY PLAN

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SYLLABUS

This report is a compilation of basic information on the Corps of Engineers Colebrook Dam and Lake to aid the assessment of the project as an emergency domestic water supply source. It was prepared as part of a drought contingency program for all Corps of Engineers reservoirs in New England. Included are sections on project description, storage capacity and allocation, operating procedure and water quality. It was not within the scope of the study to perform detailed analyses but mainly to address the emergency potential of the site and identify and discuss a variety of concerns to be considered in weighing Colebrook versus other available sources of emergency supply.

Colebrook is a multiple purpose reservoir containing storage for domestic water supply, downstream fisheries and riparian flow maintenance, and flood control. Due to the extensive storage and water rights of the Hartford Metropolitan District and those of the State's Bureau of Fisheries, it was concluded that any supplemental drought contingency storage operation at Colebrook was not feasible. The water supply potential of the resource is fully developed and rights assigned. Drought contingency measures might involve water conservation and/or reprioritizing of water use and allocation by the controlling state, municipal and local riparian users. The Corps of Engineers, in connection with its flood control operations, will continue to be judicious in emptying of stored floodwaters, with consideration given to the interests of water supply and fisheries as well as those of flood control.

COLEBROOK RIVER LAKE
DROUGHT CONTINGENCY PLAN

1. PURPOSE AND SCOPE

The purpose of this study and report was to address the limitations of a drought contingency plan of operation for Colebrook River Lake. It was prepared as part of a drought contingency program for all Corps of Engineers reservoirs in New England. This plan was based on preliminary studies utilizing readily available information. Included are a description of the project, allocation of reservoir storage, project operation and an evaluation of water quality, a discussion of impacts on other project purposes.

2. AUTHORIZATION

The authority for the preparation of drought contingency plans is contained in ER 1110-2-1941 which provides that water control managers will continually review and, when appropriate, adjust water control plans in response to changing public needs. Drought contingency plans will be developed on a regional, basin-wide and project basis as an integral part of water control management activities.

3. PROJECT AUTHORIZATION CONDITIONS

The Colebrook River Lake project was authorized by the Flood Control Act of 14 July 1960, Public Law 86-645, in accordance with the recommendations of the Chief of Engineers, set forth in House Document 443, 86th Congress, 2nd session. This authorization provided for both flood control and water supply as project purposes. Fish and wildlife conservation was subsequently added as a project purpose and the provision of storage for this purpose received its authorization from the Fish and Wildlife Coordination Act of 12 August 1958, Public Law 85-624. Construction of the dam was initiated in April 1965 and dedicated in June 1969.

4. PROJECT DESCRIPTION

Colebrook River Lake is a multiple purpose flood control, water supply and conservation project located in northwestern Connecticut on the West Branch of the Farmington River in the town of Colebrook. A map of the Farmington River watershed and the Connecticut River basin are shown on plates 1 and 2, respectively.

The reservoir has a total storage capacity of 97,700 acre-feet at spillway crest (elevation 761 feet NGVD), which

is equivalent to 15.5 inches of runoff from the project's 118 square mile drainage area. When filled to spillway crest, a 1,185 acre pool would be created. A capacity table is shown on plate 3.

The physical components of Colebrook River Lake consist of a 1,300-foot long earthfill dam, a 205-foot long ogee weir, spillway, outlet works and recreational facilities related to fishing. The outlet works consist of three hydraulic sluice gates, each 4 feet wide by 8 feet high, and a 10-foot diameter, 774-foot long flood control tunnel. Colebrook's dam embankment is situated within the pool of the West Branch Reservoir formed by Goodwin Dam, located approximately 1.5 miles downstream and owned by the Metropolitan District Commission of Hartford, Connecticut.

A summary of pertinent data at Colebrook River Lake is listed on plate 4.

5. STORAGE ALLOCATION

Colebrook River Lake is a multiple purpose flood control, water supply and fish conservation storage project. The reservoir has a total controlled storage capacity of 97,700 acre-feet, with 1,000 acre-feet assigned to dead storage, 9,800 acre-feet formerly controlled by the downstream Goodwin Dam, and another 1,000 acre-feet replacement storage for the dam embankment volume placed in the West Branch Reservoir; therefore, new usable storage created by the project is 85,900 acre-feet. Of this new storage, 30,700 acre-feet is owned by the Hartford Metropolitan District and used for downstream riparian flow control and water supply. Another 5,000 acre-feet is allocated to water supply for downstream fisheries and regulated for the Connecticut Bureau of Fisheries. The remaining 50,200 acre-feet of storage, equivalent to 7.98 inches of runoff from the 118 square miles of watershed, is allocated to flood control. It is noted at present that 5,000 acre-feet of the flood control storage is used seasonally (not beyond 30 June) to provide additional downstream flow for the spring shad fisheries. This results in seasonal infringement, inflow permitting, on the flood control pool up to elevation 713.5 feet NGVD. Storage allocation and storage elevation data for Colebrook River Lake is listed below. A plan view of Colebrook River Lake and downstream West Branch Reservoir are shown on plates 5A and 5B. Storage capacity curves are shown on plate 3.

Purpose	Storage (acre-feet)	Stratum Elevation (feet,msl)
Flood Control	50,200	708.0 - 761.0
Fish Conservation	5,000	701.2 - 708.0
Water Supply		
New	30,700	643.7 - 701.2
Replacement	1,000	641.0 - 643.7
Existing	9,800	596.3 - 641.0
Sedimentation and Dead Storage	1,000	567.0 - 596.3
TOTAL	97,700	

6. PROJECT OPERATION

a. General. Except during short duration flood regulation, releases are normally made from Colebrook River Lake per weekly request of the Hartford Metropolitan District and/or Connecticut Department of Environmental Protection. The Hartford Metropolitan District is required to discharge a specified number of acre-feet of stored water annually from its system of reservoirs in the basin for use by downstream riparian owners, and 80 percent must be discharged between 15 May and 31 October. Secondly, no less than 50 cfs outflow must be maintained at all times at the downstream Goodwin Dam and only inflows in excess of 150 cfs can be stored, exclusive of any releases from storage at the upstream Otis Reservoir.

During the summer months, June through October, releases from Colebrook are generally scheduled weekly and are equal to inflow plus planned releases from storage resulting in an augmented outflow and falling reservoir level. A continuous accounting is made of storage withdrawn by the respective allotted users. During the winter and spring months, November thorugh May, only inflows in excess of 150 cfs are stored, usually resulting in a gradual refilling of storage, first, the water supply replacement to elevation 701.2, second, the fish conservation storage to elevation 708 and lastly, the temporary seasonal spring fisheries storage encroachment on flood control to elevation 713.5. Once all storage is filled to elevation 713.5, either during the winter or spring runoff period, outflow is generally maintained equal to inflow until the following summer season, except for short duration flood regulation.

b. Flood Control Regulation. During periods of high riverflows the regulation of releases at Colebrook Lake is under the direction of the Corps of Engineers. Colebrook is operated to reduce flooding in the Farmington River and in concert with a system of other reservoirs to reduce flooding on the main stem Connecticut River. Following flood regulation any stored flood waters above elevations 708.0 or 713.5, depending on season, are judiciously emptied by the Corps of Engineers considering the interest of water supply and fisheries as well as those of flood control. A detailed description of Colebrook River Lake regulating procedures for flood control is presented in "Appendix J - Farmington River Watershed," Connecticut River Basin Master Water Control Manual, dated June 1970.

7. MONITORING OF HYDROLOGIC CONDITIONS

The Reservoir Control Center directs the reservoir regulation activities at 28 New England Division flood control dams, and continually monitors rainfall, snow cover and runoff conditions throughout the region. When any of these hydrologic parameters have been well below normal for several months and it appears that possible drought conditions might develop, the Corps Emergency Operations Center (EOC) will be so informed. The EOC will then initate discussions with the respective Federal and State agencies and other in-house Corps elements to review possible drought concerns and future Corps actions.

8. POTENTIAL FOR WATER SUPPLY REALLOCATION

a. General. There are several authorities that provide for the use of reservoir storage for water supply at Corps of Engineers projects. They vary from the provision of water supply storage as a major purpose in new projects to the discretionary authority to provide emergency supplies to local communities in need. In addition, guidance contained in ER 1110-2-1941 directs field offices to determine the short-term water supply capability of existing Corps reservoirs that would be functional under existing authorities. Congressional authorization is not required to add municipal and industrial water supply if the related revision in regulation would not significantly affect operation of the project for the originally authorized purposes.

b. Drought Contingency Storage. Colebrook River Lake already includes a significant amount of water supply storage as one of its multiple purpose functions. Due to the storage and water rights of the Hartford Metropolitan District, as part of its water supply operations in the Farmington River watershed, and those of the State's Bureau of Fisheries, for its streamflow maintenance needs, any supplemental drought contingency storage plans at Colebrook are precluded. The water supply potential of the resource is fully developed and

rights are fully assigned. Drought contingency measures might involve water conservation and/or reprioritizing of water use and allocation by the controlling State, municipal and local riparian users. The Corps of Engineers, in connection with its flood control operations, will continue to be judicious in emptying of stored floodwaters, with consideration given to the interests of water supply and fisheries as well as those of flood control.

9. WATER QUALITY EVALUATION

a. Water Quality Classification. The Colebrook River Lake project is located in parts of Connecticut and Massachusetts and has to meet the water quality standards of both States.

The West Branch of the Farmington River and its tributaries above Colebrook River Lake are rated class A by the Massachusetts Division of Water Pollution Control (MDWPC). Class A waters are designated for use as public water supply. A designation as to whether this section of the Farmington River is a warm water or a cold water fishery has not been made. Technical requirements for warm water fisheries include a minimum dissolved oxygen concentration (DO) of 5 mg/l and a maximum temperature of 83 degrees Fahrenheit. For cold water fisheries the minimum DO is 6 mg/l, and the maximum temperature is 68 degrees Fahrenheit. Other technical requirements for class A warm and cold water fisheries include total coliform bacteria not to exceed a log mean of 50 per 100 ml for a set of samples during any monthly sampling period, total dissolved solids not to exceed 500 mg/l, chlorides not to exceed 250 mg/l, sulfates not to exceed 250 mg/l and nitrate not to exceed 10 mg/l as nitrogen.

In Connecticut, the West Branch of the Farmington River is rated class AA by the Connecticut Department of Environmental Protection (CDEP). Class AA waters are existing or proposed drinking water supply impoundments and tributary surface waters. Technical requirements for Connecticut class AA waters include dissolved oxygen levels of not less than 5 mg/l at any time; fecal coliform bacteria not to exceed a mean of 20 per 100 ml nor more than 100 per 100 ml in more than 100 percent of the samples collected; sodium not to exceed 20 mg/l; pH as naturally occurs; turbidity not to exceed 10 JTU over ambient levels; and no color, taste, odor, temperature increase, or phosphorus other than of natural origin.

b. Water Quality Requirements for Contingency Use. There are two drought contingency water quality requirements. The waters must meet State standards for surface waters and must be of a quality suitable for domestic or industrial water supply use. A water which meets Massachusetts class A or Connecticut class AA standards would be usable for public

water supply after simple filtration and disinfection; the water quality required for industrial water supply depends on the specific industrial process involved. The waters of Colebrook River Lake would always be suitable for firefighting or ground water replentishment.

c. Existing Water Quality. There are no significant point source discharges upstream from Colebrook River Lake and the actual condition of the West Branch of the Farmington River is class A in Massachusetts according to the MDWPC and class AA in Connecticut according to the CDEP. The only water quality concern relating to Colebrook is the finding of some elevated levels of heavy metals by the NED Water Quality Laboratory. Measured concentrations of mercury and cadmium at Colebrook River Lake have exceeded the criteria to protect sensitive aquatic life, but not drinking water criteria. Iron concentrations have exceeded the levels that can cause laundry staining problems in a public water supply. Metal levels at Colebrook are typical of what has been found at most NED projects and, therefore, are not a cause for special concern. Measurements of other water quality parameters including DO, temperature, coliform bacteria, total dissolved solids, chlorides, sulfate, nitrate and sodium have usually shown levels as good or better than their class A or class AA criteria. An indication of the general good water quality at Colebrook Lake is its well known trout fishery which is annually stocked by the States of Connecticut and Massachusetts and the U.S. Bureau of Sports Fisheries and Wildlife.

d. Water Quality Conclusions. Colebrook River Lake has good water quality which generally meets or exceeds the requirements of its Massachusetts class A and Connecticut class AA water quality classification.

10. SUMMARY AND CONCLUSIONS

Drought contingency operations at Colebrook Lake for supplemental water supply would be quite limited and are not recommended. Colebrook, located on the West Branch, Farmington River in northwestern Connecticut, is a multiple purpose reservoir containing storage for domestic water supply, downstream fisheries and riparian flow maintenance, and flood control. The water supply potential of the resource is considered fully developed with rights assigned. Drought contingency measures, rather than operations oriented, might involve water conservation and/or reprioritizing of water use and allocation by the controlling state, municipal and local riparian users. The Corps of Engineers, in connection with its flood control operations, will continue to be judicious in emptying of stored floodwaters, with consideration given to the interests of water supply and fisheries as well as those of flood control.

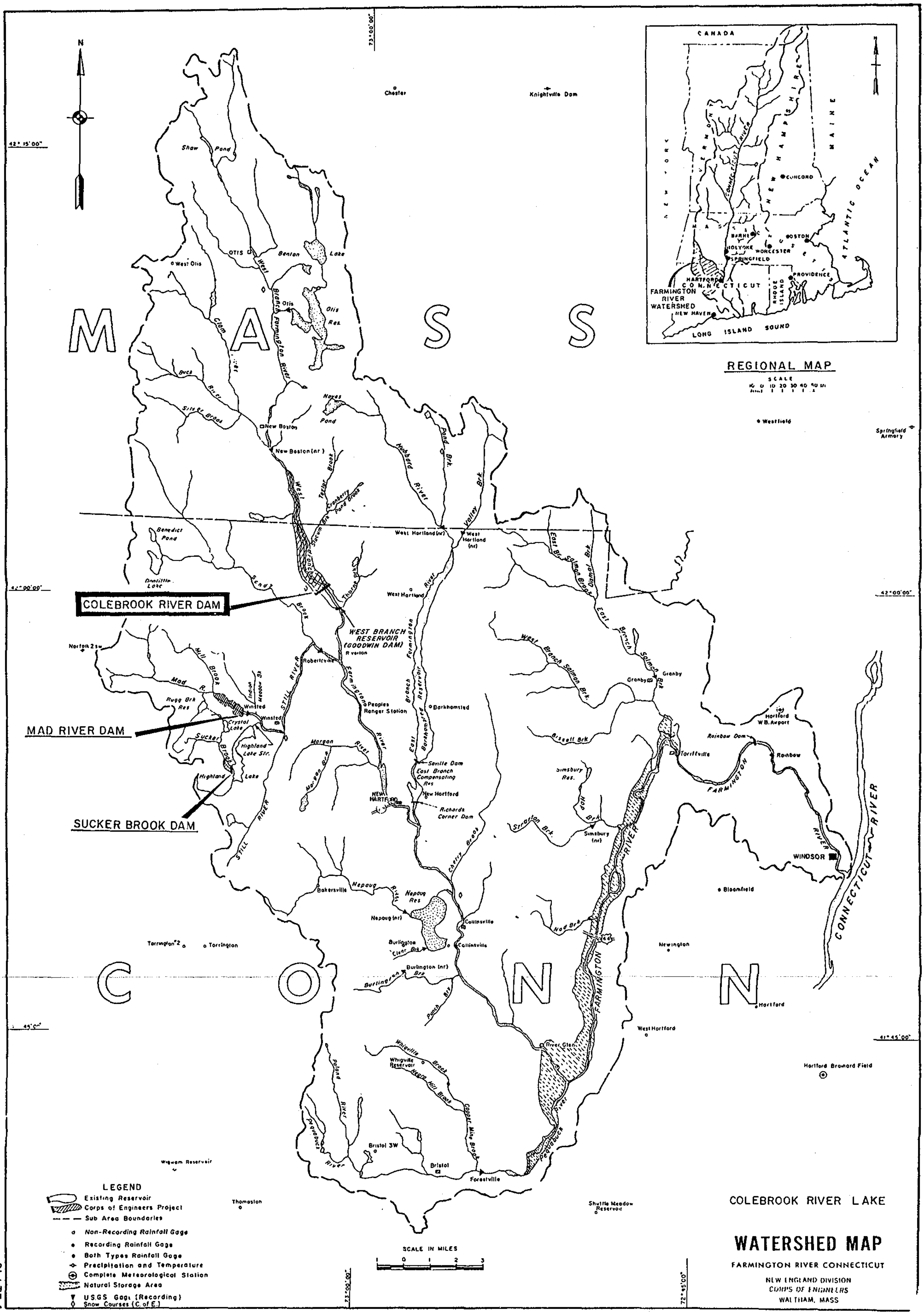
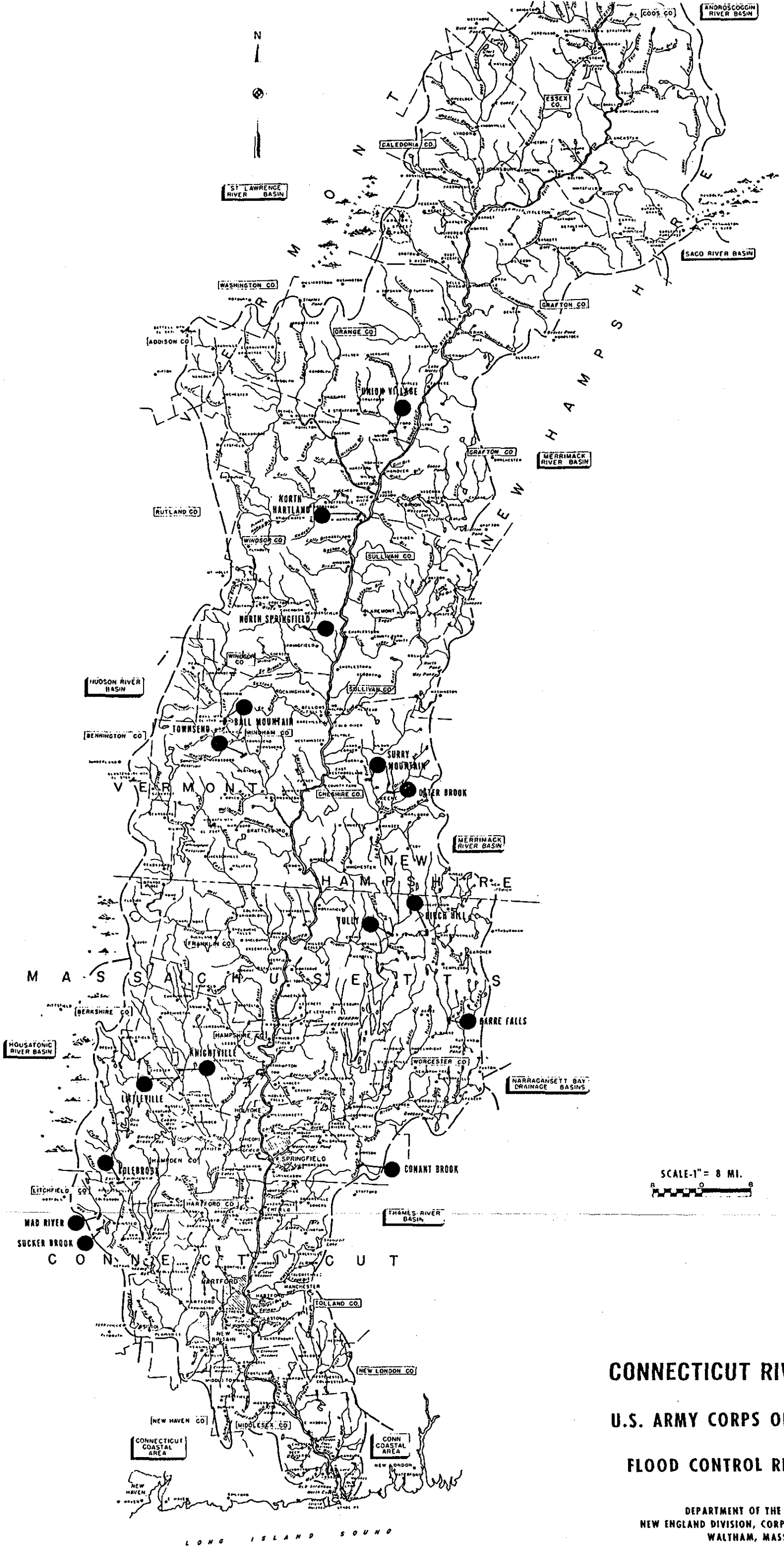

REGIONAL MAP
CANADA
NEW YORK
VERMONT
NEW HAMPSHIRE
MAINE
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
CONNECTICUT RIVER
ATLANTIC OCEAN
LONG ISLAND SOUND
CONCORD
BARRE
BOSTON
HOLYOKE
WORCESTER
SPRINGFIELD
HARTFORD
PROVIDENCE
NEW HAVEN
FARMINGTON RIVER WATERSHED
SCALE
COLEBROOK RIVER DAM
MAD RIVER DAM
SUCKER BROOK DAM
WEST BRANCH RESERVOIR (GOODWIN DAM)
Otis Res.
Benton Lake
Shaw Pond
Noyes Pond
New Boston
West Hartland
Winsted
Crystal Lake
Highland Lake
Riverton
Robertsville
Peoples Ranger Station
Barkhamsted
Saville Dam
East Branch Compensating Res
New Hartford
Richards Corner Dam
Nepaug Res
Collinsville
Burlington
Bristol
Forestville
River Glen
Simsbury
Granby
Tariffville
Rainbow Dam
Rainbow
Windsor
Bloomfield
Newington
Hartford
West Hartford
Hartford Brainard Field
Torrington
Thomaston
Westfield
Springfield Armory
Chester
Knightville Dam
42° 15' 00"
42° 00' 00"
41° 45' 00"
73° 00' 00"
72° 45' 00"
LEGEND
Existing Reservoir
Corps of Engineers Project
Sub Area Boundaries
Non-Recording Rainfall Gage
Recording Rainfall Gage
Both Types Rainfall Gage
Precipitation and Temperature
Complete Meteorological Station
Natural Storage Area
U.S.G.S Gage (Recording)
Snow Courses (C. of E.)
SCALE IN MILES
COLEBROOK RIVER LAKE
WATERSHED MAP
FARMINGTON RIVER CONNECTICUT
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS

PLATE 1



SCALE-1" = 8 MI.

CONNECTICUT RIVER BASIN

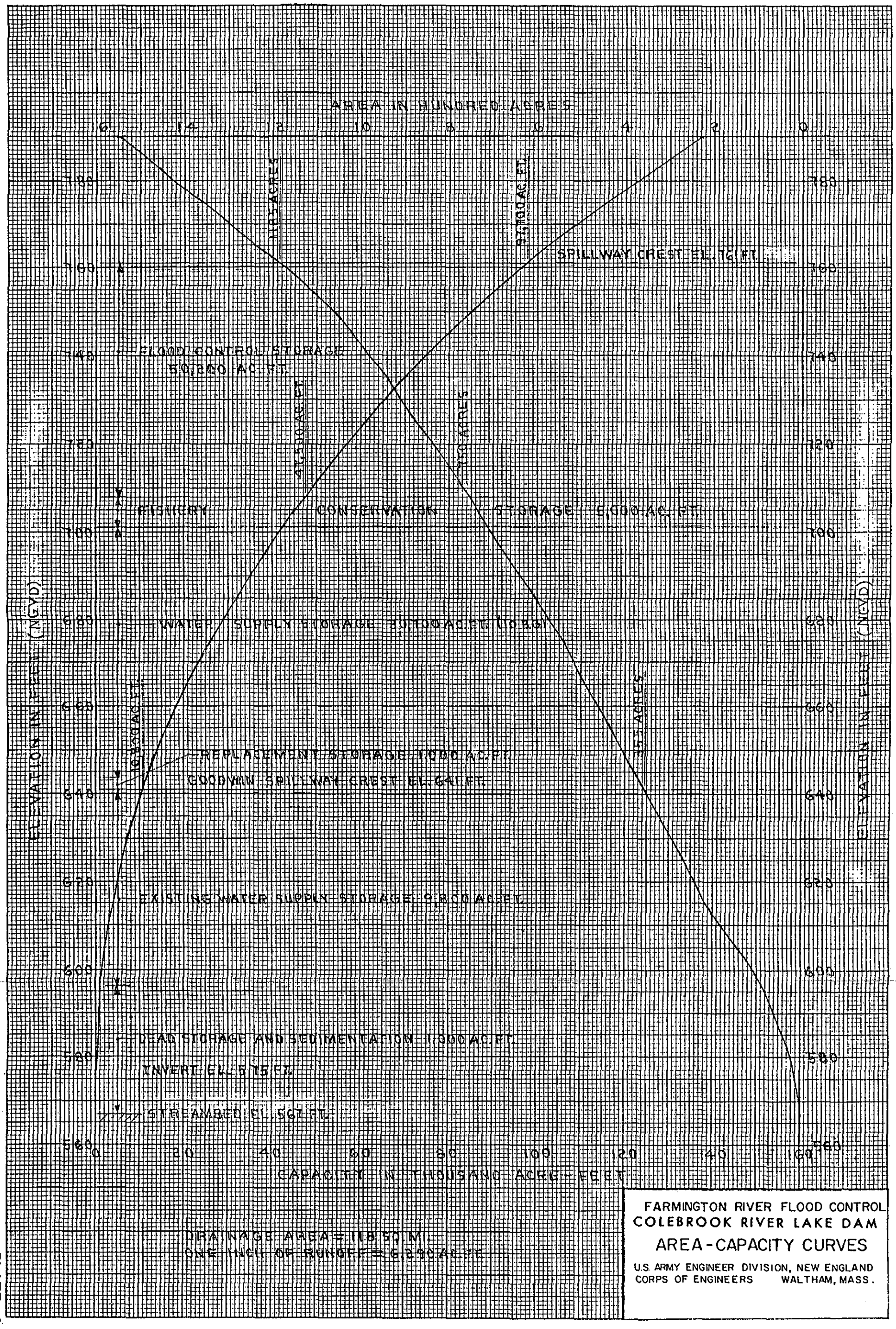
U.S. ARMY CORPS OF ENGINEERS

FLOOD CONTROL RESERVOIRS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

JANUARY 1981

PLATE 2



FARMINGTON RIVER FLOOD CONTROL
COLEBROOK RIVER LAKE DAM
AREA-CAPACITY CURVES

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS WALTHAM, MASS.

PLATE 3

PERTINENT DATA
COLEBROOK RIVER LAKE DAM AND RESERVOIR

LOCATION — West Branch Farmington River, Colebrook, Connecticut

DRAINAGE AREA — 118 square miles

RESERVOIR STORAGES

	Dead Storage and Sedimentation	Hartford Met. District - Water Supply			Fish Conservation Fall Season	Flood Control	Total at Spillway Crest
		Existing	Replacement	New			
Full Pool Elevation (ft, NGVD)	596.3	641.0	643.7	701.2	708.0	761.0	761.0
Capacity (acre-feet)(net)	1,000	9,800	1,000	30,700	5,000	50,200	97,700
(inches)(net)	0.16	1.55	0.16	4.88	0.79	7.98	15.52
Full Pool Area (acres)	90	355	370	713	750	1,185	1,185

EMBANKMENT FEATURES

	Main Dam	Dike
Type	Rolled earth fill with rock slope prot.	Rolled earth fill
Length (ft)	1,300	1,240
Top Elevation (ft, NGVD)	790	790
Maximum Height (ft)	223	54
Top Width (ft)	30	30
Slopes	1 on 1-3/4 to 1 on 2	1 on 2-1/2

SPILLWAY FEATURES

Type	Chute spillway, ogee weir
Crest Length (ft)	205
Crest Elevation (ft, NGVD)	761

SPILLWAY DESIGN FLOOD

Peak Inflow (cfs)	165,000
Peak Outflow (cfs)	96,000
Maximum Surcharge (ft. above crest)	24 (El. 785 ft, NGVD)

OUTLET WORKS

Type	Circular tunnel in rock
Tunnel, Inside Diameter (ft)	10
Length of Tunnel (ft)	774
Tunnel Invert Elevation (ft, NGVD)	575
Service Gate Type	Hydraulic, sluice
Service Gate Size	Three 4' x 8'
Emergency Gate Type	Hydraulic, sluice
Emergency Gate Size	Three 4' x 8'
Downstream Channel Capacity (cfs)	3,400 (Est.)

LAND ACQUISITION

Fee Taking Elevation (ft, NGVD)	766 (5 ft. above spillway crest) or 300 ft.*
Flowage Easement Elevation (ft, NGVD)	790**

PROJECT COST — $14,100,000 (Est.)

DATE OF COMPLETION — June 1970

MAINTAINED BY — New England Division, Corps of Engineers

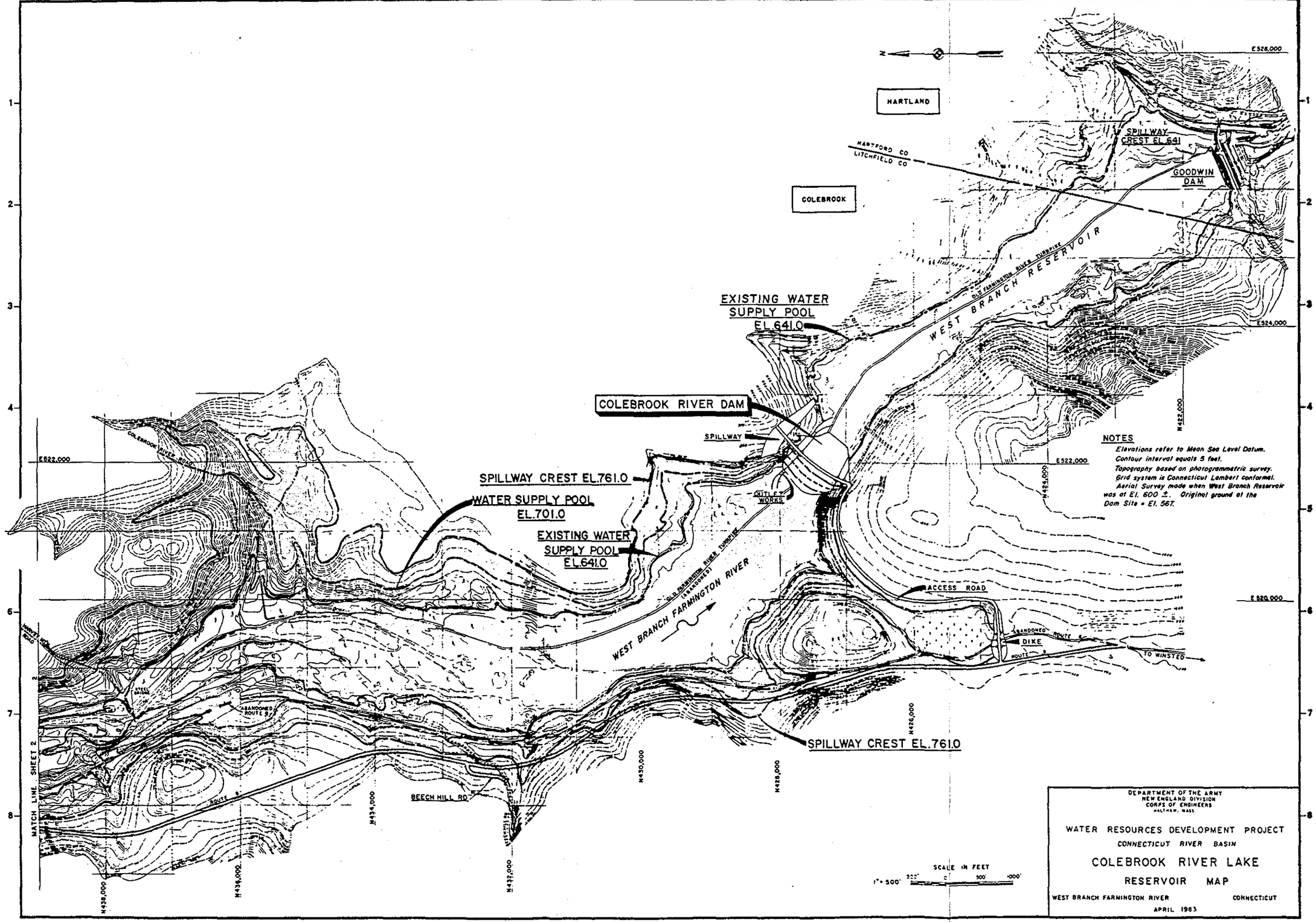
Notes: The total flood control storage of 50,200 a.f. includes 5,000 a.f. of joint use storage for spring shad fishery between January and June. At maximum surcharge elevation 785.0 ft, NGVD, the total storage utilized is 132,000 a.f. (20.97 in.) and area inundated is 1,510 acres.

* Horizontally from full pool, whichever is greater.
** On lands owned by Metropolitan District of Hartford County, Connecticut and Connecticut State Forest Department.

PLATE 4

CORPS OF ENGINEERS

U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval equals 5 feet.
Topography based on photogrammetric survey.
Grid system is Connecticut Lambert conformal.
Aerial Survey made when West Branch Reservoir was at El. 600 ±. Original ground at the Dam Site = El. 567.

SCALE IN FEET

1" = 500'

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS

WATER RESOURCES DEVELOPMENT PROJECT

CONNECTICUT RIVER BASIN

COLEBROOK RIVER LAKE

RESERVOIR MAP

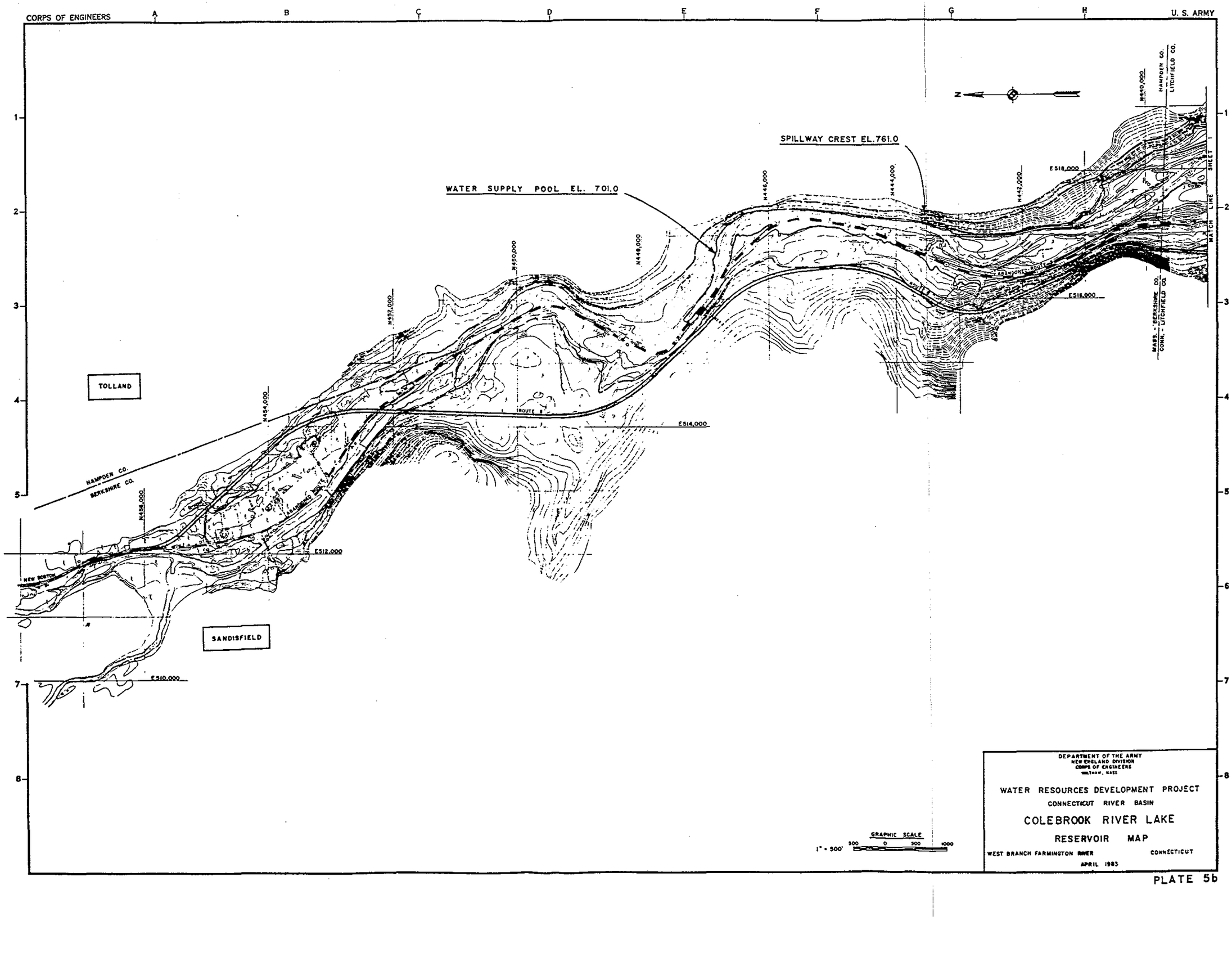
WEST BRANCH FARMINGTON RIVER CONNECTICUT

APRIL 1983

PLATE 5a

CORPS OF ENGINEERS

U. S. ARMY



GRAPHIC SCALE
1" = 500' 500 0 500 1000

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS

WATER RESOURCES DEVELOPMENT PROJECT

CONNECTICUT RIVER BASIN

COLEBROOK RIVER LAKE

RESERVOIR MAP

WEST BRANCH FARMINGTON RIVER CONNECTICUT

APRIL 1985

PLATE 5b